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1 Warning

Warning: If the information in this manual is not followed exactly, a fire or explosion may result causing property damage, personal injury or death.

Warning: Improper installation, adjustment, alteration, service or maintenance can cause injury or property damage. Refer to this manual. For assistance or additional information consult a qualified installer, service agency or the gas supplier.
Upon completion of the installation, these instructions should be handed to the user of the appliance for future reference.

Featuring

Electronic Ignition and Power Venting

For your safety

Do not store or use gasoline or other flammable, combustible or corrosive vapors and liquids in the vicinity of this or any other appliance.

Warning: Carefully plan where you install the heater. Correct combustion air supply and flue pipe installation are very important. If a gas appliance is not installed correctly, fatal accidents can result from lack of air, carbon monoxide poisoning or fire.

Warning: Exhaust gas must be vented to outside using proper vent material suitable for category III vent systems and temperatures up to 480°F. Vent and combustion air connector piping must be sealed gas-tight to prevent possibility of flue gas spillage, carbon monoxide emissions and risk of fire, resulting in severe personal injury or death.

Warning: Place the heater in a location where water leaks will do NO DAMAGE to adjacent areas or lower floors.

Warning: Field wiring connections and electrical grounding must comply with local codes, or in the absence of local codes, with the latest edition of the National Electric Code, ANSI/NFPA 70, or in Canada, all electrical wiring must comply with the local codes and the Canadian Electrical Code, CSA C22.1 Part 1.

Warning: Shock hazard line voltage is present. Before servicing the water heater, turn off the electrical power to the water heater at the main disconnect or circuit breaker. Failure to do so could result in severe personal injury or death.

What to do if you smell gas

- Close gas valve. Open windows.
- Do not try to light any appliance.
- Do not touch any electrical switch; do not use any phone in your building.
- Immediately call your gas supplier from a neighbor's phone. Follow the gas supplier's instructions.
- If you cannot reach your gas supplier, call the fire department.
- Installation and service must be performed by a qualified installer, service agency or the gas supplier.

Warning: The heater must be disconnected from the gas supply piping system during any pressure testing of that system at test pressures equal to or more than 0.5 psig.

FCC:
This device complies with Part 15 of the FCC rules. Operation is subject to the following two conditions: (1) This device may not cause harmful interference, and (2) this device must accept any interference received, including interference that may cause undesired operation.

Caution: Any changes or modifications not expressly approved by the party responsible for compliance could void the user's authority to operate the equipment.

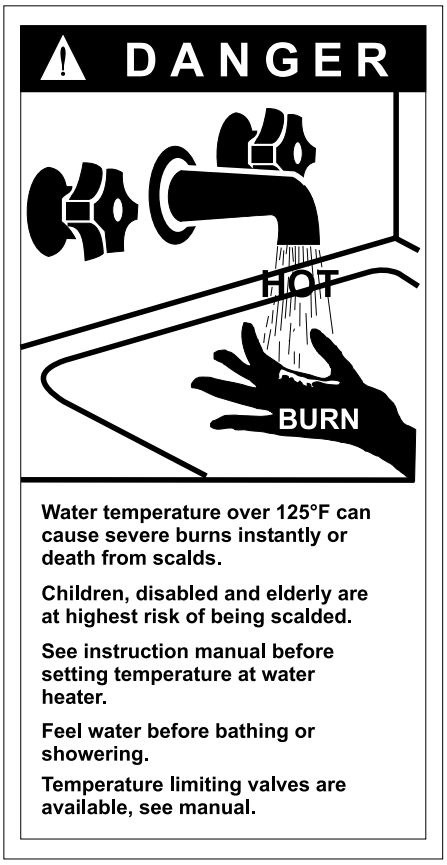

DANGER
HOT
BURN
Water temperature over 125°F can cause severe burns instantly or death from scalds.
Children, disabled and elderly are at highest risk of being scalded.
See instruction manual before setting temperature at water heater.
Feel water before bathing or showering.
Temperature limiting valves are available, see manual.

Fig. 1

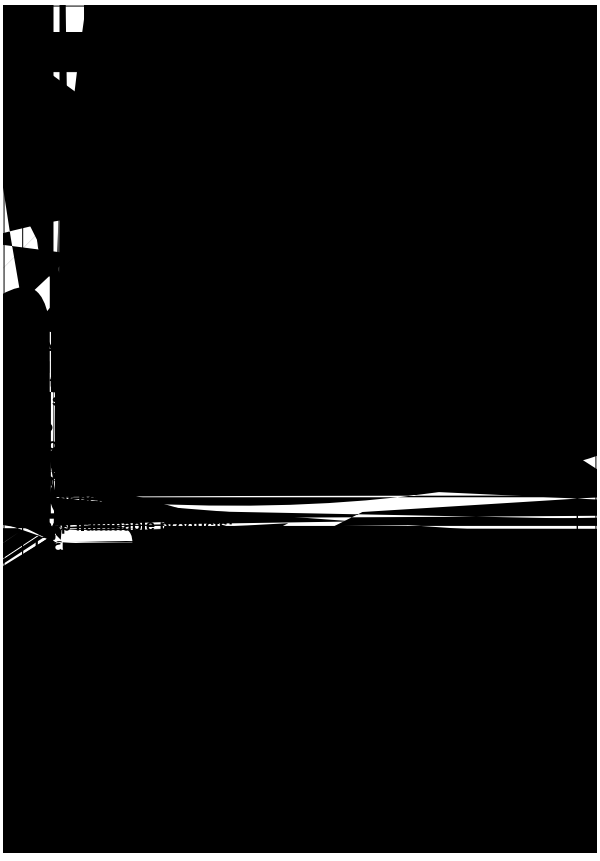


Fig. 2

2 Appliance details

2.1 Features

Parts

- Touch Pad interface control
- High power pre-mix compact burner with low Nox emissions
- Modulating Gas Valve with constant gas:air ratio control
- Modulating water valve for improved comfort and temperature control.

Safety

- Flame sensor (ionization) rod
- Overheat sensor
- Temperature limiter
- Fan speed monitoring.

High Quality Materials for Long Working Life

- Copper heat exchanger
- High efficiency Ceramat Burner
- Compact space saver: mounts on a wall with a supplied bracket.
- Easily removable one-piece cover.

Features

- LCD Display
- On/Off and Temperature control switches
- Reset button
- Program Key (Selectable temperature default)
- Failure codes for easy diagnostic and repair.

Accessories

- Optional wireless remote control accessory to operate with the appliance
- Vent termination kit.

BOSCH is constantly improving its products, therefore specifications are subject to change without prior notice.

2.2 GWH-635-ES Specifications (Technical data)

Approved in US/Canada

Capacity

Maximum flow rate: 6.35 GPM (24 l/min) at a 45°F (25°C) rise.

Maximum output

142,968 Btu/h (41.8 kW)

Maximum input

175,000 Btu/h (51.2 kW)

Efficiency in %

Recovery efficiency 86.5%

Min. Output

31,131 Btu/h (9.1 kW)

Temperature Control

Selection range: 100°F (38°C) - 140°F (60°C)

Default temperature: 122°F (50°C)

Stability: +/- 2°F (+/- 1°C)

Gas Requirement

Gas connection (inches) - ¾”

Inlet gas pressure under operation (with a high hot water flow rate)*

- Propane: 11” - 14” water column
- Natural Gas: 5” - 14” water column.

* To measure Gas Pressure, see Measuring Gas Pressure, chapter 2.12.

Venting

A condensate trap is integrated into the exhaust flue gas collar of the heater, the supplied condensate drain tube must be installed to it for proper removal of condensate from the trap. See chapter 2.9 for Venting.

Water

- Hot water connection (inches) - ¾”
- Cold water connection (inches) - ¾”
- Water valve material: Polymer (PPS) (Polypropylene Sulfid)
- Minimum water flow: 0.8 gallon/minute (3 l/m)
- Minimum recommended water pressure: 30 PSI (2.07 bar)
- Connections:
  - Bottom of heater

Combustion

- NOx ≤ 55 ppm
- CO ≤ 250 ppm
- CO_2 level set from factory, see chapter 9.

Dimensions

- Depth (in): 8 ½" (220 mm)
- Width (in): 15 ¾" (400 mm)
- Height (in): 23 ½" (600 mm)
- Weight: 47 pounds (21 kg).

Gas types

Natural Gas.
LP Gas.
Converting the gas type can only be done by a certified gas technician with a calibrated CO_2 analyzer.
Call BBTNA for conversion instructions.

Voltage

120 V AC (50/60 Hz)

Amperage

IDLE - 40 mA
Operation - ≤ 2,5 A

Noise

≤ 50 db (A)

Safety devices

- Flame failure device (ionization flame rod sensor)
- Pressure relief valve (supplied with heater)
- Over heat prevention (temperature limiter).

Water resistant

IP X4 (protection against water drops)

UNPACKING THE GWH-635-ES HEATER

This heater is packed securely.

The box includes:

- Pressure relief valve (150 psi / 200,000 Btu rating)
- Bracket for wall hanging the heater
- Exhaust vent adaptor (with 4 screws and gasket provided)
- Condensate drain tube kit
- Combustion air inlet adaptor (with 3 screws and gasket provided)
- Plastic decal shields for covering front cover screws and control panel, installer should affix these decals to the front of the unit after installation is complete. See Fig. 3
- Installation manual
- Product registration card
- Energy Guide label.

Do not lose this manual. Please complete and return the enclosed product registration card.

Before installing the unit, be certain you have the correct heater for your type of Gas - Propane or Natural Gas. Identification labels are found on the shipping box, and on the rating plate which is located on the right side panel of the cover.

To remove front cover

- Loosen the two Philips head screws located on front panel (beneath plastic decal shields if they are already attached, see Fig. 3)
- Lift front cover panel upward and remove.

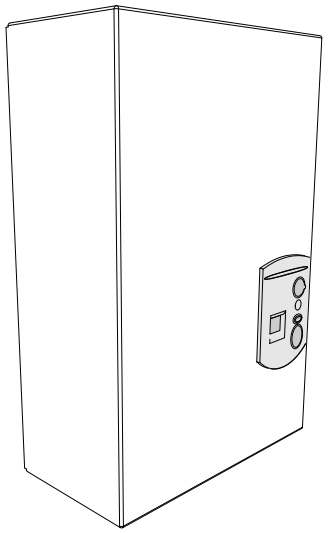


Fig. 3 Remove front cover

The GWH-635-ES is not approved or designed for:

- Manufactured (mobile) homes, RV's or boats
- Heating or other recirculating/pumping applications*
- Outdoor installation (use only Outdoor Model GWH-635-ESO)
- Solar/preheat backup or high temperature booster use.

* This includes domestic hot water circulator pump loop systems that may previously exist in a home hot water system. The use of a small electric mini-tank (4-6 gallon size) should be used for this application; when designed so the pump will circulate the hot water in the mini-tank only and through the building's hot water return loop (timed or thermostatic controlled operation of the pump is commonly done). The GWH-635-ES should be plumbed in line before the mini-tank water heater, contact BBTNA if further instruction is needed.

2.3 Dimensions and Minimum installation clearances

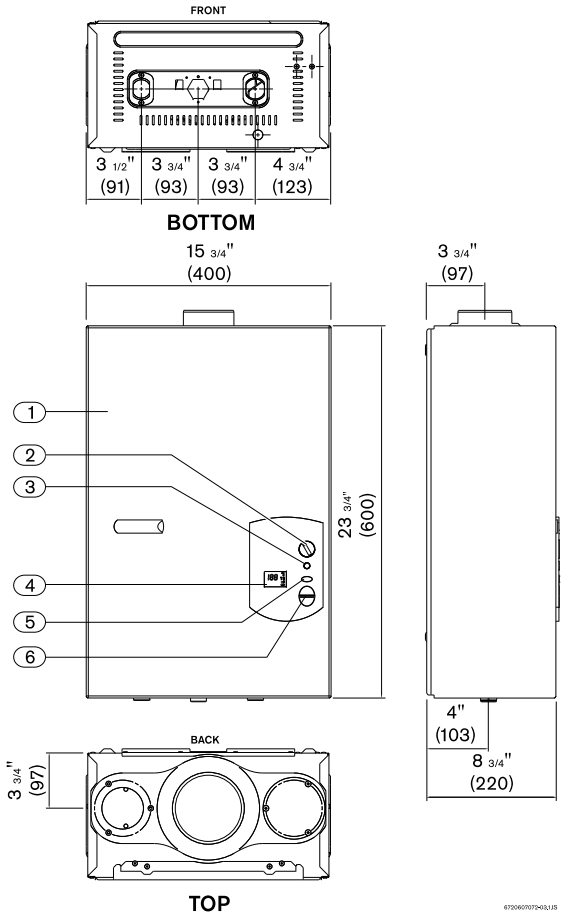


Fig. 4 Dimensions

1 Cover
2 On/Off switch
3 Reset button
4 LCD display
5 Program button
6 Temperature buttons

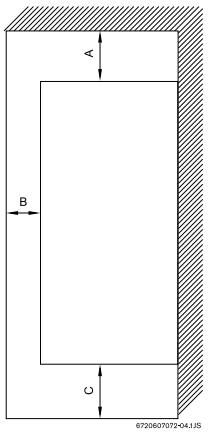


Fig. 5 Minimum clearances

	Model GWH-635-ES
TOP (A)	12”
FRONT (B)	1”
BACK	0”
SIDES	1”
FLOOR (C)	12”
VENT DIAMETER	3”

Table 1 Minimum clearances

2.4 General rules to follow for safe operation

- **1.** You should follow these instructions when you install your heater. In the United States: The installation must conform with local codes or, in the absence of local codes, the National Fuel Gas Code ANSI Z223.1/NFPA 54.
  In Canada: The Installation should conform with CGA B149.(1,2) INSTALLATION CODES and /or local installation codes.
- **2.** Carefully plan where you install the heater. Correct combustion air supply and vent pipe installation are very important. If not installed correctly, fatal accidents can be caused by lack of air, carbon monoxide poisoning or fire.
- **3.** When the unit is installed indoors and ROOM SEALED (twin pipe) it is permitted to be located in bathrooms, bedrooms and occupied rooms that are normally kept closed. See chapter 2.9. If the unit will be installed indoors and use indoor combustion air, the place where you install the heater must have enough ventilation. **The National Fire Codes do not allow UNSEALED gas fired water heater installations in bathrooms, bedrooms or any occupied rooms normally kept closed.** See chapter 2.5 and 2.8.
- **4.** You must vent your heater. See section on VENTING.
- **5.** The appliance and its gas connection must be leak tested before placing the appliance in operation.
  The appliance must be isolated from the gas supply piping system by closing its individual manual gas shutoff valve (not supplied with heater) during any pressure testing at pressures in excess of ½ Psig (3.5 kPa).
- **6.** Keep water heater area clear and free from combustibles and flammable liquids. Do not locate the heater over any material which might burn.
- **7. Correct gas pressure** is critical for the optimum operation of this heater. Gas piping must be sized to provide the required pressure at the maximum output of the heater, while all the other gas appliances are in operation. Check with your local gas supplier, and see the section on connecting the gas supply.
- **8.** Should overheating occur or the gas supply fail to
  ply at the manual gas
  e. Note: manual gas
  ith the heater.
  if any part has been
  a qualified service
  liance and to replace
  and any gas control

2.5 Proper location for installing your heater

Carefully select the location of the water heater. For your safety and for proper heater operation, you must provide combustion air to the heater and a proper exhaust vent system.
Follow the guidelines below:

- **1.** Locate the heater where venting, gas and plumbing connections are feasible and convenient.
- **2.** It is strongly recommended that the heater be installed as a ROOM SEALED heater (twin pipe). If the heater will be installed as an UNSEALED heater (sing368 0 Td (g)Tj 3.12233 0 Td (e)Tj 5.28395 0

2.6 Clearances

The GWH-635-ES is design certified for installation on a combustible wall (see 2.7 Mounting installation) provided the floor covering below the heater is noncombustible. For installations in an alcove or closet, maintain the minimum clearances to combustible and non-combustible materials listed below. See also Fig. 5.

A. Top 12 inches (306 mm)
B. Front 1 inches (25 mm)
C. Back 0 inches
D. Sides 1 inches (25 mm)
E. Bottom 12 inches (306 mm)

Clearances from any exhaust vent pipe are dependent upon the clearance requirements of the stainless steel vent pipe manufacturer. Single wall stainless steel (AL29-4C) vent pipe (vent type rated for Category III appliances) must be used when exhaust venting this appliance. See 2.9 Venting.

2.7 Mounting installation

Fig. 6 Mounting the heater

2.8 Combustion air requirements

The GWH-635-ES is a sealeg water recommended,that,outdoor combustioe,air,1e,supplied toherunitr(

The GWH-635-ES is design certified for mounting on a wall. Secure the wall mounting bracket provided with the heater to a wall surface. See Fig. 6.
Do not install this appliance on a carpeted wall or over floor covering which is combustible, such as carpet. The heater must be mounted on a wall using appropriate anchoring materials.
If the mounting bracket is unable to line up on two wall studs it is recommended that support board(s), either 1x4's or ½" (minimum) plywood first be attached across a pair of studs and then the heater should be attached to the support boards. The heater should be kept level on the wall surface. See Fig. 6.
Expansion and contraction of piping due to changing water temperature in the pipes imparts movement to the heater which, if mounted directly to a brittle, friable board, such as plasterboard, can cause failure of mounting.
Before installing the unit, be certain you have the correct heater for your type of Gas - Propane or Natural Gas. Identification labels are found on the shipping box, and on the rating plate which is located on the right side panel of the cover.

construction, infiltration air is normally adequate to provide air for combustion.

- Appliances located in confined spaces:
  The confined space must be provided with two permanent openings, one commencing within 12 inches (304.8mm) of the top and one commencing within 12 inches (304.8mm) of the bottom of the enclosure. Each opening must have a minimum free area of one square inch per:
  – 1000 Btu/hr (292.81 Watts) if all air is taken from inside the building
  – 2000 Btu/hr (585.62 Watts) if all air is taken from the outside by horizontal ducts
  – 4000 Btu/hr (1171.24 Watts)if all air is taken from the outside by direct openings or vertical ducts

Or the confined space must be provided with one permanent opening or duct that is within 12 inches (304.8mm) of the ceiling of the enclosure. This opening must have a minimum free area of one square inch per:

– 3000 Btu/hr (878.43 Watts) if all air is taken from the outside by a direct opening or vertical duct.

Louvers, grills and screens have a blocking effect, when used, increase the sizes of your openings by 300% for wood louvers (as wood type will reduce the free air by 75%) and 40% for metal louvers (as metal will reduce the free air by 30%). Refer to the National Fuel Gas Code for complete information. In buildings of tight construction all air should be taken from outside.

NOTE: It is not recommended to use interior room air (SINGLE PIPE vent system) in areas that commonly experience below freezing temperatures. Clothes dryers, furnaces, woodstoves, bathroom or kitchen fans or other gas appliances can create negative air pressure when operating by removing air from the building. Cold air will be drawn back into the building, and if drawn through the water heater a freezing situation may occur. TWIN PIPE (room sealed) method of venting is recommended, see page 12.

NOTE: When installed in beauty shops, barber shops, or other facilities where chemicals that generate corrosive or flammable products such as aerosol sprays are routinely used, shall be installed as sealed unit following the TWIN PIPE SYSTEM method of venting.

2.9 Venting

Warning: Do not reduce the vent (exhaust and combustion) pipe sizes and do not common vent with any other vented appliance or stove.

NOTE: This appliance's exhaust must be vented to the outside1 with sealed stainless steel vent pipe (AL29-4C), the minimum vent length is 3 feet (a 90 degree vent elbow is equivalent to 2 ½ feet). The appliance's flue gasses are under positive pressure and must travel through a stainless steel 3" or 4" pipe that is sealed gas tight.

NOTE: The exhaust collar on the water heater is 3" diameter and its collar must always be used, a 3" to 4" increaser will be required to be first connected to the exhaust collar when 4" venting is used. Different stainless steel vent manufacturer's have different joint systems, do not mix vent pipe or joining methods from different manufacturer's.

Stainless steel vent pipe is equipped with sealing gaskets for ease of installation, proper safety and durability. The heater shall not be vented in combination with any other appliance; the appliance must only be vented with a dedicated sealed vent system.

	Z flex	Protech	Heat Fab	BBTNA
3" VENTING 3" Horizontal Terminal	2SVSTB03	FSTB3	9390 TEE	2SVSTB03
3" Vertical terminal	2SVSRCF03	FSRC3	5300CI	2SVSRCF03
4" VENTING Requires a 3" to 4" Increaser	2SVI0304	FS0304TI	9374	2SVI0304
4" Horizontal terminal	2SVSRTF04	FSTB4	9490TEE	FXHOOD
4" Vertical terminal	2SVSRCF04	FSRC4	5400CI	----------

Table 2 Terminals/Adapters Part Numbers

Caution: The vent system must be installed by a qualified agency in accordance with these instructions. If improperly installed a hazardous condition such as explosion or Carbon Monoxide poisoning could result. BBTNA will not be responsible for improperly installed appliances.

Establish vent clearances that comply with the vent manufacturer's specifications. In all cases follow local codes. See table 3.

The maximum flue gas exhaust temperature on the GWH-635-ES is 437°F (225°C)							
Venting Options	Exhaust vent diameter and material	* Exhaust vent maximum length	* Exhaust vent minimum length	Combustion air pipe diameter and material	Combustion air pipe maximum length	Vent pipe clearances within an unenclosed space	Vent pipe clearances within an enclosed space
Room sealed (twin pipe)	3 or 4+ inch stainless steel (AL29-4C) sealed vent pipe	26 feet (8 m) with one elbow. Less 2½ feet for each additional 90° elbow	3 feet	3 inch PVC, aluminum or galvanized pipe	26 feet (8 m) with one elbow. Less 2½ feet for each additional 90° elbow	** See vent manufacturer's specifications	** See vent manufacturer's specifications
Open combustion (single pipe)	3 or 4+ inch stainless steel (AL29-4C) sealed vent pipe	26 feet (8 m) with one elbow. Less 2½ feet for each additional 90° elbow	3 feet	See chapter 2.8	See chapter 2.8	** See vent manufacturer's specifications	** See vent manufacturer's specifications
Exhaust vent is always fan assisted. Installation of exhaust vent and combustion air piping may be run vertically or horizontally and in separate directions if required. + The exhaust collar on the water heater is 3" diameter and its collar must always be used, a 3" to 4" increaser will be required to be first connected to the exhaust collar when 4" venting is used. * A maximum of three 90 degree elbows are permitted in both the exhaust and combustion air vent lengths. The total vent length must be reduced by 1 ¼ feet for every 45° elbow used in the vent system. ** Stainless steel (AL29-4C) vent pipe is manufacturerd by Z-Flex, Protech and Heat Fab. NOTE: clearance distances are variable depending if the vent pipe is installed in an enclosed or unenclosed space, the exhaust flue gas temperature and the orientation of the vent pipe.							

Table 3

Minimum exhaust vent size and length

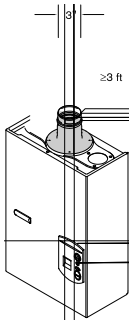


Fig. 7

Maximum exhaust vent and combustion air inlet lengths

The appliance should be located as close to the point of termination as possible. The maximum vent length is 26 feet (8 m) with one 90 degree elbow. Subtract 2½ feet from the total vent length for each additional 90° elbow used (a maximum of three 90° elbows are permitted in the total vent length), or subtract 1 ¼ feet for every 45° elbow used. Horizontal sections of vent must pitch ¼" for every foot of horizontal length, to prevent the pooling of condensate, and be supported at 4 foot intervals with overhead hangers.

Note: Listed thimbles or collars are necessary to pass through wall and ceiling partitions. If the vent system passes through combustible areas where the vent clearance requirements cannot be maintained, it is permissible to chase straight sections of sealed 3 inch single wall vent through 4 inch (or greater) Type-B vent. The distance to combustibles using this chase technique is 1 inch. **Note: Type-B vent should never be used as the actual exhaust vent system for the appliance, as it is not gas tight.**

Fig. 8

Note: reduce 2½ ft for each 90° elbow used after the first one, reduce 1 ¼ ft for each 45° elbow.

Vent Safety System

The GWH-635-ES will shut down if inadequate exhaust venting is detected or a lack of combustion air is provided to the unit; see troubleshooting section on page 24. See error code to confirm error, correct the problem and then reset the heater before operating.

Attaching the exhaust and air inlet connection adaptors to the top of the heater

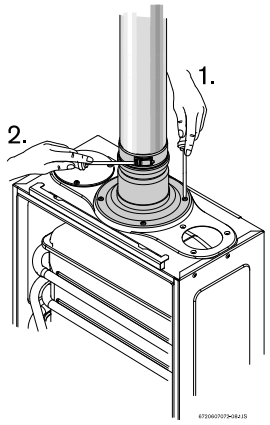


Fig. 9

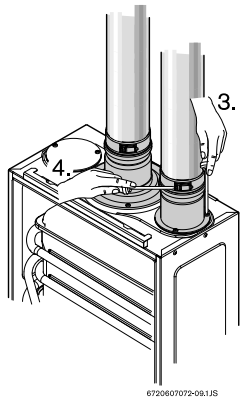


Fig. 10

- Attach the flue gas exhaust accessory (8 705 504 114) to the top of the unit (position 1) using the 4 screws and gasket provided, and fully insert 3" stainless steel vent pipe into the accessory and tighten the clamp (position 2).
- Attach the combustion air inlet accessory (8 705 504 115) to the top of the unit (position 3) using the 3 screws and gasket provided, and fully insert 3" combustion air pipe into the accessory and tighten the clamp (position 4). NOTE: The appliance has the possibility to mount the combustion air inlet accessory on the top right or on the top left side of the heater. The combustion air inlet that is not used must be kept sealed.

Use of the external condensate drain tube kit (supplied with the heater) on the exhaust collar

- The condensate drain tube kit must be used for all installation types. **Failure to install condensate drain will void the warranty**.
- When installing the condensate drain tube kit at the exhaust collar (see diagram below), be sure to form a trap by means of a 3" (76.2 mm) loop filled with water. The supplied tube is 3/8" ID high temperature silicone and must be attached to the condensate tapping on the exhaust collar with its supplied gear clamp (first remove screw at tapping point).
- To increase tube length, connect vinyl type tubing after the supplied tube.
- The condensate must be disposed of according to local regulations.

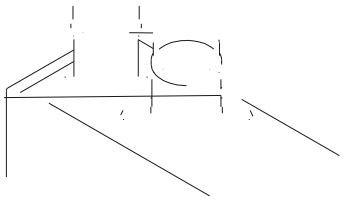


Fig. 11

2.9.1 Venting options

Installing this water heater as a room sealed (TWIN PIPE SYSTEM) is the recommended method. Contact BBTNA or dealer for available vent termination kits and vent materials for this water heater.

Exhaust venting shall be done with 3" or 4" stainless steel (AL29-4C) vent pipe.

Room sealed installation (TWIN PIPE SYSTEM)

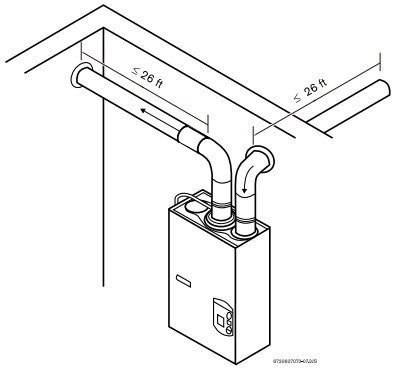


Fig. 12

Combustion air pipe: ≤ 26 ft (8 m)
Exhaust vent pipe: ≤ 26 ft (8 m)

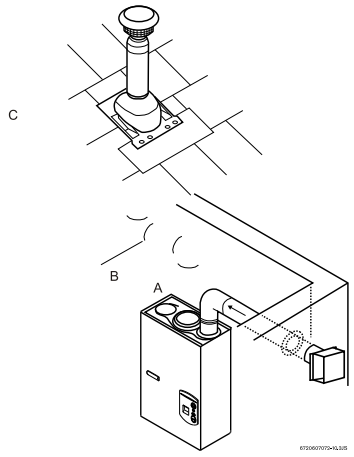


Fig. 13

Combustion air pipe: ≤ 26 ft (8 m)

Exhaust vent pipe: A+B+C ≤ 23½ ft (7.2 m)
Note: reduce 2½ ft for each 90° elbow used after the first one, reduce 1 ¼ ft for each 45° elbow.
A maximum of three 90-degree elbows are permitted in both the exhaust and combustion air vent lengths.

The exhaust vent pipe and combustion air pipe can be run vertically or horizontally. Maximum length for each individual pipe is 26 feet (8 m) with one elbow, for each additional 90° elbow after the first elbow you must reduce 2½ feet from the total vent length, or 1 ¼ feet for each 45° elbow.

Open combustion installation (SINGLE PIPE SYSTEM)

Not recommended in cold climate areas, see Chapter 2.8.

Fig. 14

Exhaust vent pipe: ≤ 26 ft (8 m)

Fig. 15

Exhaust vent pipe: A+B+C ≤ 23½ ft (7.2 m)

The exhaust vent system must vent directly to the outside of the building and an adequate amount of indoor combustion air must be provided for this installation. See chapter 2.8.
Connecting a one piece 90 degree elbow pipe to the combustion air inlet adaptor is necessary, this will prevent debris or objects from ever falling into the inlet opening.
Note: reduce 2½ ft for each elbow used after the first one, reduce 1 ¼ ft for each 45° elbow.
A maximum of three 90-degree elbows are permitted.

Recommended exhaust vent terminator position

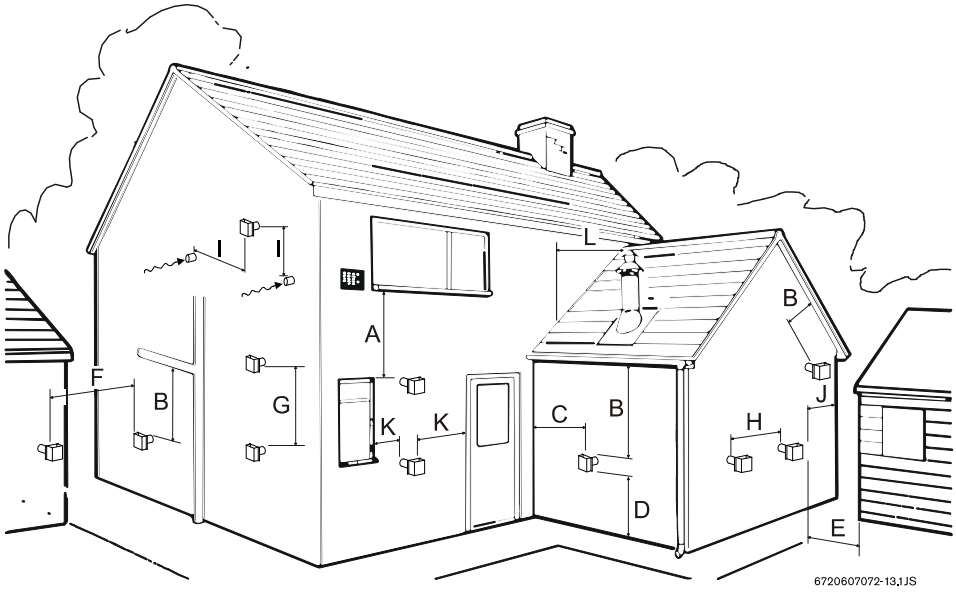


Fig. 16

Ref.	Description	Minimum distance
A	Directly below an opening; operable windows, doors and any non-mechanical fresh air openings	36 in
B	Below a gutter, sanitary pipework or eaves	24 in
	Below a gutter, sanitary pipework or eaves, protected by metal shielding	12 in
C	From any internal corner	12 in
D*	Above ground	12 in
	Above a paved sidewalk	7 ft
E	From an opposing wall or structure facing the termination	24 in
	From any other building opening, gas utility meter, service regulator or the like	36 in
F	From a terminator facing a terminator	48 in
G	Vertically between two exhaust vent terminators on the same wall	60 in
H	Horizontally between two exhaust vent terminators on the same wall	12 in
I**	Horizontally from combustion air inlet of GWH-635-ES	36 in
	Vertically above or below combustion air inlet of GWH-635-ES	
	From the combustion air inlet of any other equipment	6 ft
J	From any external corner	12 in
K	Horizontally from an opening; operable windows, doors and any non-mechanical fresh air openings	12 in
L	Vertically from a wall, roof slope, or obstruction (venting through a flat or pitched roof)	see ABOVE THE ROOF requirements on following page

Table 4

* Subject to local codes and anticipated snow level

** Other equipment that operates with a mechanical air inlet may require greater distances, reference manufacturer's instructions

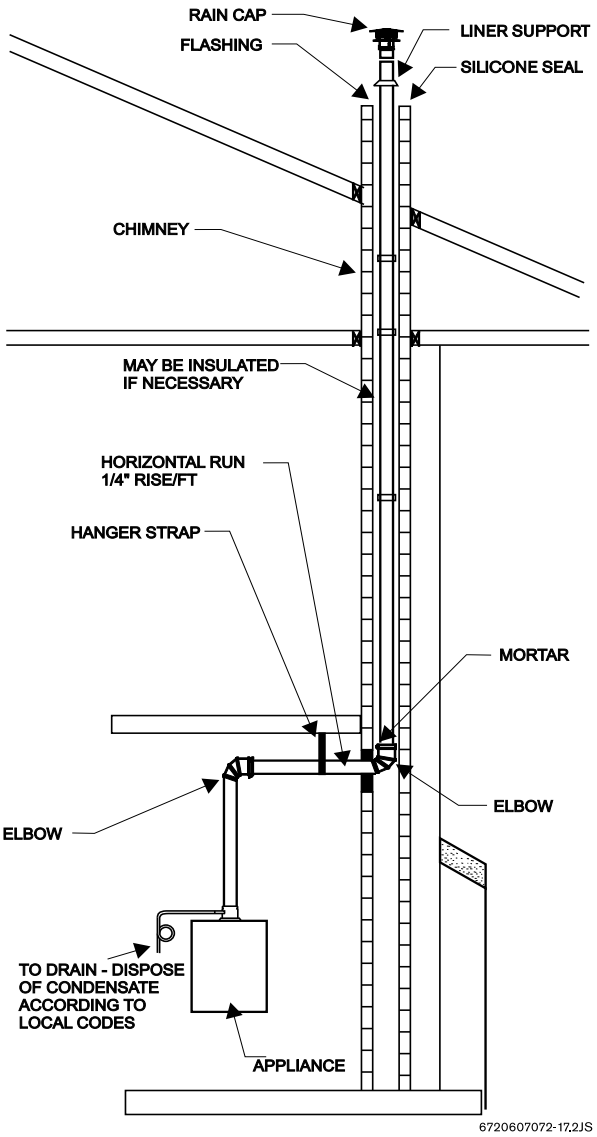


Fig. 20 Vertical venting installation - Masonry Chimney (combustion air piping not being shown)

A condensate drain tube must be attached to the exhaust collar of the heater for all vent type applications, see page, see page 11.

2.10 Gas piping & connections

Before connecting the gas supply, check the rating plate on the right side of the heater to be sure that the heater is rated for the same gas to which it will be connected.
In the United States: The installation must conform with local codes or, in the absence of local codes, the National Fuel Gas Code ANSI Z223.1/NFPA 54.
In Canada: The Installation should conform with CGA B149 INSTALLATION CODES and/or local installation codes.

GAS LINE SIZING

The gas supply piping should be sized according to the National Fuel Gas Code for a maximum draw of 175,000 BTUH. First determine the effective length of the gas supply line by measuring the actual length of piping, and then adding 5 ft. (1.52m) for every elbow or “T” to the actual length. Use the charts in Fig. 22 to determine the pipe diameter necessary to accommodate the BTU (Wh) demand of the unit. If there are more gas drawing appliances on the line, size according to the maximum amount of BTU (Wh) demand.

Note: It is important that if any flexible gas line is used, above or below ground between the gas supply meter/ regulator and the water heater, that it be sized properly. Consult the gas sizing specification tables provided by the flexible gas line manufacturer and sample CSST flexible gas line tables in Figure 22.

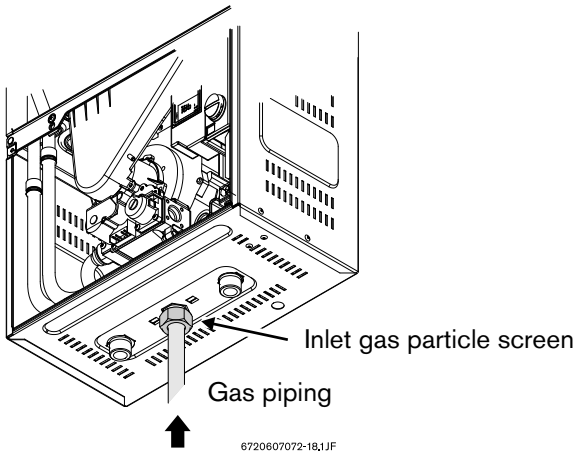


Fig. 21

- Install a manual gas shut off valve, on the gas supply line.
- The use of a union when connecting gas pipe to the gas inlet connection is critical, this will facilitate any necessary servicing and cleaning of the inlet gas particle screen.
- Flexible gas line connectors are not recommended because they are commonly undersized and restrict gas flow. Oversize the diameter of any flexible gas appliance connector if one must be used.

FOR NATURAL GAS

Maximum Capacity of pipe in Cubic Feet of Gas per Hour for Gas Pressure of 0.5 Psig or less and a Pressure drop of 0.3 in Water Column (0.75mbar).(Based on a 0.60 Specific Gravity Gas) Btu numbers given in thousands.

Follow boxed numbers for piping just one 635-ES (example: ¾" B.I. Natural Gas pipe for 20 ft (6.1m). will handle 190,000 btu's (55.7 kWh). For multiple appliances combine the total btu input load and then refer to applicable chart below.

Nominal Iron Pipe Size, inches	Internal Diameter inches	Length of Black Iron Pipe, Feet													
		10	20	30	40	50	60	70	80	90	100	125	150	175	200
1/4	0.364	32	22	18	15	14	12	11	11	10	9	8	8	7	6
3/8	0.493	72	49	40	34	30	27	25	23	22	21	18	17	15	14
1/2	0.622	132	92	73	63	56	50	46	43	40	38	34	31	28	26
3/4	0.824	278	190	152	130	115	105	96	90	84	79	72	64	59	55
1	1.049	520	350	285	245	215	195	180	170	160	150	130	120	110	100
1 1/4	1.380	1050	730	590	500	440	400	370	350	320	305	275	250	225	210
1 1/2	1.610	1600	1100	890	760	670	610	560	530	490	460	410	380	350	320
2	2.067	3050	2100	1650	1450	1270	1150	1050	990	930	870	780	710	650	610

Length of Flexible Corrugated Stainless Steel Tubing (CSST), Feet							
Tube size, inches	EHD*	10	20	30	40	50	60
1/2	18 EHD	82	58	47	41	37	34
3/4	23 EHD	161	116	96	83	75	68
1	30 EHD	330	231	188	162	144	131
1 1/4	37 EHD	639	456	374	325	292	267

* EHD = Equivalent Hydraulic Diameter. The greater the value of EHD, the greater the gas capacity of the tubing.

FOR LP GAS

Maximum Capacity of Pipe in Thousands of BTU per Hour of Undiluted Petroleum Gases (at 11 inches Water Column Inlet Pressure) (Based on a Pressure Drop of 0.5 Inch Water Column).

* EHD = Equivalent Hydraulic Diameter. The greater the value of EHD, the greater the gas capacity of the tubing.

Nominal Iron Pipe Size, Inches	Black Iron Pipe Length of Pipe, Feet											
	10	20	30	40	50	60	70	80	90	100	125	150
1/2	275	189	152	129	114	103	96	89	83	78	69	63
3/4	567	693	315	267	237	217	196	185	173	162	146	132
1	107	732	590	504	448	409	378	346	322	307	275	252
1 1/4	220	149	121	103	913	834	771	724	677	630	567	511
1 1/2	330	229	185	155	141	127	118	108	102	976	866	787

Length of Flexible Corrugated Stainless Steel Tubing (CSST), Feet							
Tube size inches	EHD*	10	20	30	40	50	60
1/2	18 EHD	129	91	74	64	58	53
3/4	23 EHD	254	183	151	131	118	107
1	30 EHD	521	365	297	256	227	207
1 1/4	37 EHD	971	661	528	449	397	359

Maximum Capacity of Semi-Rigid (flexible, non corrugated) Tubing in Thousands of BTU per Hour of Undiluted Liquefied Petroleum Gases (at 11 inches Water Column Inlet Pressure).

(Based on a Pressure Drop of 0.5 Inch Water Column)

* Source National Fuel Gas Code NFPA 54, ANSI Z223.1 - No Additional Allowance is necessary for an ordinary number of fittings

Copper										
Outside diameter Inch	Length of Tubing, Feet									
	10	20	30	40	50	60	70	80	90	100
3/8	39	26	21	19	_	_	_	_	_	_
1/2	92	62	50	41	37	35	31	29	27	26
5/8	199	131	107	90	79	72	67	62	59	55
3/4	329	216	181	145	131	121	112	104	95	90

Fig. 22

2.11 Gas line sizing

- It is strongly recommended that the Natural Gas pipe be Black Iron pipe the entire distance from the outside meter to the inlet of the gas connection. ¾" Black Iron pipe up to 20 feet (6.1m) and 1" Black Iron pipe up to 70 feet (21.34m) distances. Flex line is NOT recommended, but if used, then oversize the diameter of the flex pipe, keep the length to a minimum and try to keep the flex line as straight as possible.
- It is strongly recommended that the LP Gas pipe be semi-rigid copper or Black Iron pipe from the outside regulator to the inlet of the gas connection. For semi-rigid copper piping: 5/8" up to 10 feet (3.05m) and ¾" up to 30 feet (9.14m) distances. For Black Iron piping: ½" up to 20 feet (6.1m) and ¾" up to 80 feet (24.38m) distances. Flex line is NOT recommended, but if used, then oversize the diameter of the flex pipe, keep the length to a minimum and try to keep the flex line as straight as possible.

THESE FIGURES ARE FOR GWH-635-ES SUPPLY ONLY, ALL OTHER APPLIANCES IN THE BUILDING MUST BE INCLUDED IN THE PIPE SIZING.

National Fuel Gas Code requires that a sediment trap (drip leg) be installed on gas appliances not so equipped. Also, a manual gas shut off valve must be installed on the gas supply line within close proximity of the water heater and be visible from the water heater.

Warning: The heater must be disconnected from the gas supply piping system during any pressure testing of that system at test pressures equal to or more than 0.5 psig.

The water heater must not be piped with gas supply pressures in excess of 0.5 psig. If overpressure has occurred, such as through improper testing of the gas lines or malfunction of the supply system, the gas valve must be checked for safe operation.
When connections are made, check for gas leaks at all joints. Apply some soapy water to all gas fittings. Soap bubbles are a sign of a leak.

Danger: If you have a leak, shut off the gas. Tighten appropriate fittings to stop leak. Turn the gas on and check again with a soapy solution. Never test for gas leaks using a match or flame.

2.12 Measuring gas pressure

2.12.1 Connecting Manometer

- Shut off gas.
- Remove front cover and locate inlet gas pressure measuring point (see Fig. 24).
- Loosen screw inside test point fitting (do not remove) and connect manometer tube on test point.

2.12.2 Static Pressure Test

- Turn gas supply back on.
- Operate all other gas appliances on same gas piping system at maximum output.
- Record static gas pressure reading in table 5.

2.12.3 Operating Pressure Test

- ON/OFF switch in position OFF (0).
- Press and hold "Program" (M) button and turn ON/OFF switch to ON position.

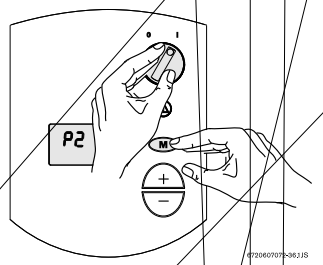


Fig. 23

- As soon as '188' is displayed, release "Program" button and the display should read P2.
- Press ⌓, until P1 appears.

Note: While in this mode the appliance will run constantly at maximum power and allow maximum water flow.

- Turn on high volume of hot water flow (at least 6 gpm) and heater will ignite.
- Record operating gas pressure reading in table 5.

Gas pressures lower than 5" W.C. for Natural Gas or 11" W.C. for LPG will result in insufficient degree rise to the hot water being used, and must be corrected. See Gas Connections, chapter 2.10.

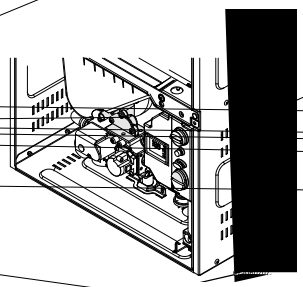


Fig. 24 Gas pressure measuring (left tapping)

Static Gas Pressure Reading (see Chapter **2.12**) enter here: _____
Operating Gas Pressure Reading (see Chapter **2.12**) enter here: _____

Table 5

HIGH ALTITUDE OPERATION

Altitude	Natural Gas:	Liquid Propane:	
0 - 4,000 ft (0 - 1,219 m)	no modification	no modification	For operation at elevations above 2,000 ft (610 m) the equipment ratings shall be reduced at the rate of 4% for each 1,000 ft (305 m) above sea level
4,000 ft - 7,000 ft (1,219 m - 2,134 m)	CO_2 adjustment with flue gas analyzer required See chapter 9 for instructions.		
Above 7,000 ft (above 2,134 m)	Not approved		

Table 6

2.13 Water connections

When facing the heater, the ¾" cold water inlet is on the bottom right and the hot water outlet is on the bottom left. Install the heater centrally in the building if possible and make hot water piping runs as short as possible.

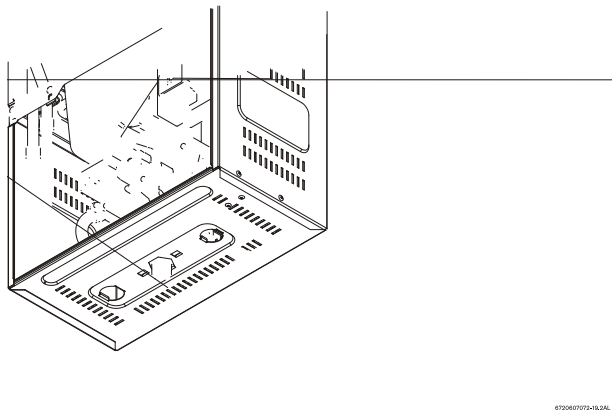


Fig. 25

- **THE USE OF A UNION WHEN CONNECTING BOTH WATER PIPES TO THE INLET AND OUTLET CONNECTIONS IS RECOMMENDED, THIS WILL FACILITATE ANY NECESSARY SERVICING AND REQUIRED CLEANING OF THE INLET WATER PARTICLE SCREEN.**

Although water piping throughout the building may be other than copper, we recommend that copper, galvanized or suitably rated stainless steel flex line piping be used for the water heater connections (follow local codes if more stringent). Never sweat any rigid piping directly to or beneath the water connections, damage can occur to the internal water valve from heating of the pipe. Plastics or other PEX type plumbing line materials are not suitable for connecting directly to the water heater. Keep water inlet and outlet pipes to no less than ¾" (19.05mm) diameter to allow the full flow capacity.
If the cold and hot connections to the heater are reversed, the heater will not function. Be certain there are no loose particles or dirt in the piping. Blow out or flush the lines before connecting to the water heater. Full port valves should be installed on both the cold water supply and hot water outlet lines to facilitate servicing the heater (see Fig. 26). For installation on a private well system with the use of a pressure tank, the lowest pressure range setting recommended is 30-50 psi (2.07 and 3.45bar).

Connecting the pressure relief valve (PRV)

A listed pressure relief valve supplied with the heater must be installed at the time of installation. No valve is to be placed between the PRV and the heater. No reducing coupling or other restriction may be installed in the discharge line. The discharge line must be a minimum of 4" above a drain and installed such that it allows complete drainage of both the PRV and the line. The location of the PRV must be readily accessible for servicing or replacement, and be mounted as close to the water heater as possible. See Fig. 26. To install the PRV, a suitable fitting connected to an extension on a "T" fitting can be sweated to the hot water line.
Support all piping.

Fig. 26 Plumbing Connections and Pressure Relief Valve

2.14 Electrical connections

Warning: For safety reasons, disconnect the power supply to the heater before any service or testing is performed.

Warning: This heater must be electrically grounded in accordance with the most recent edition of the National Electrical Code. NFPA 70. In Canada, all electrical wiring to the heater should be in accordance with local codes and the Canadian Electrical Code, CSA C22.1 Part 1. Do not rely on the gas or water piping to ground the metal parts of the heater.

The GWH-635-ES requires an electrical power supply from a 120VAC 60Hz circuit and must be properly grounded.
A means for switching off the 120VAC power supply must be provided.
The heater is wired as shown in the wiring diagram (chapter 6, Fig. 37).

2.15 Operating instructions

- Before proceeding with the operation of the heater make sure that the system is filled with water.
- Turn off power supply to heater.
- Open the cold water inlet supply to the heater fully.
- Open a hot water faucet to permit the water to fill the heater and the piping and to eliminate the air trapped in the system.
- Close the hot water faucet after the water flows freely and all the air has escaped from the system. Turn on power supply to heater. The water heater is now ready to operate.

NOTE: A default temperature setting of 122 F will appear on the display screen.

2.16 For your safety read before operating your water heater

Warning: If you do not follow these instructions exactly, a fire or explosion may result causing property damage, personal injury or loss of life.

A. This appliance is equipped with electronic ignition for lighting the main burners. When turning the heater on, follow these instructions exactly.
B. Before operating the unit, set the On/Off switch to the On (**I**) position.

WHAT TO DO IF YOU SMELL GAS

- Do not try to light any appliance.
- Do not touch any electric switch; do not use any phone in your building.
- Immediately call your gas supplier from a neighbors phone. Follow the gas supplier's instructions.
- If you cannot reach your gas supplier, call the fire department.

C. Use only your hand to turn the on/off control switch. Never use tools. Follow these instructions exactly. If control switch is jammed, close the gas supply and call a qualified service technician. Attempted forceful repair may result in a fire or explosion.
D. Do not use this appliance if any part has been under water. Immediately call a qualified service technician to inspect the appliance and to replace any part of the control system and any gas control which has been under water.

2.17 Lighting and operating instructions

- **1.** STOP! Read the previous safety information.
- **2.** The gas valve must be shut off by putting the ON/OFF switch to position (**0**). Wait five (5) minutes to clear out any gas. If you smell gas, STOP! Follow "B" in the safety information above. If you do not smell gas, go to the next step.
- **3.** This appliance is equipped with electronic ignition for lighting the main burners. When turning the heater on, follow these instructions exactly.
- **4.** Set the ON/OFF switch to the (**I**) position. In this position, the water heater is ready to use.
- **5.** Open a hot water tap.
- **6.** The burners will remain on until the hot water tap is turned off.

NOTE: on a first time initial installation or after gas line work has been done, existence of air in the gas line will cause ignition delay when the hot water is turned on. This will result in an error (EA) on the units display screen. This is normal. When this occurs, leave the hot water running and wait 3-5 seconds, then reset the unit (Fig. 26, pos. 2). Wait for (EA) to disappear. The heater will begin to attempt ignition again, if the (EA) reappears then repeat this same process until all air has been bled from the gas line.

When the heater is in operation you will hear its power vent fan and burner operating. Upon turning off the hot water flow the power vent fan will continue to operate for up to 60 seconds to exhaust all flue gases. The power vents fan speed is variable depending on the rate of hot water used and the burner output.

TO TURN OFF GAS TO APPLIANCE

- Turn off the manual gas shut off on the supply line to the heater and set the ON/OFF switch to the OFF (**0**) position. Note: a manual gas shut off valve is not supplied with the heater.

3 Operation instructions

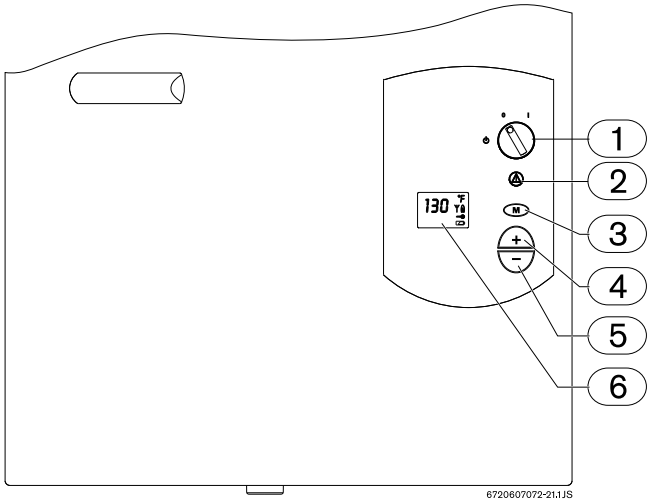


Fig. 27

1 On/Off switch
2 Reset button
3 Program Key
4 Increasing temperature selector
5 Decreasing temperature selector
6 LCD display

3.1 Power

On

- To start the appliance switch the button to position (**I**).
  LCD display the default temperature - temperature factory setting 122°F (50°C).

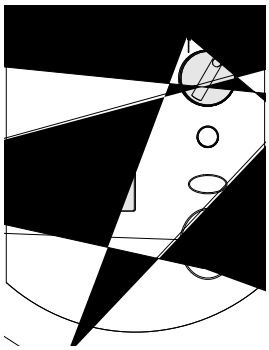


Fig. 28

Off

- To shut down the appliance switch the button to position (**0**).

3.2 Temperature selection

To select water temperature outlet:

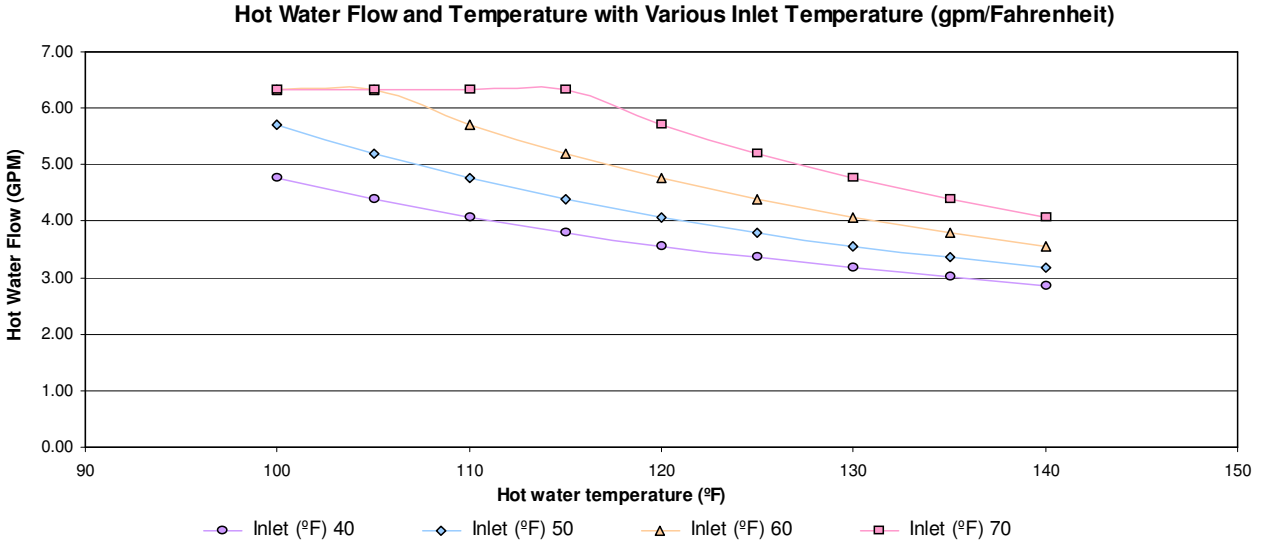
- Press buttons and in order to reach requested temperature.

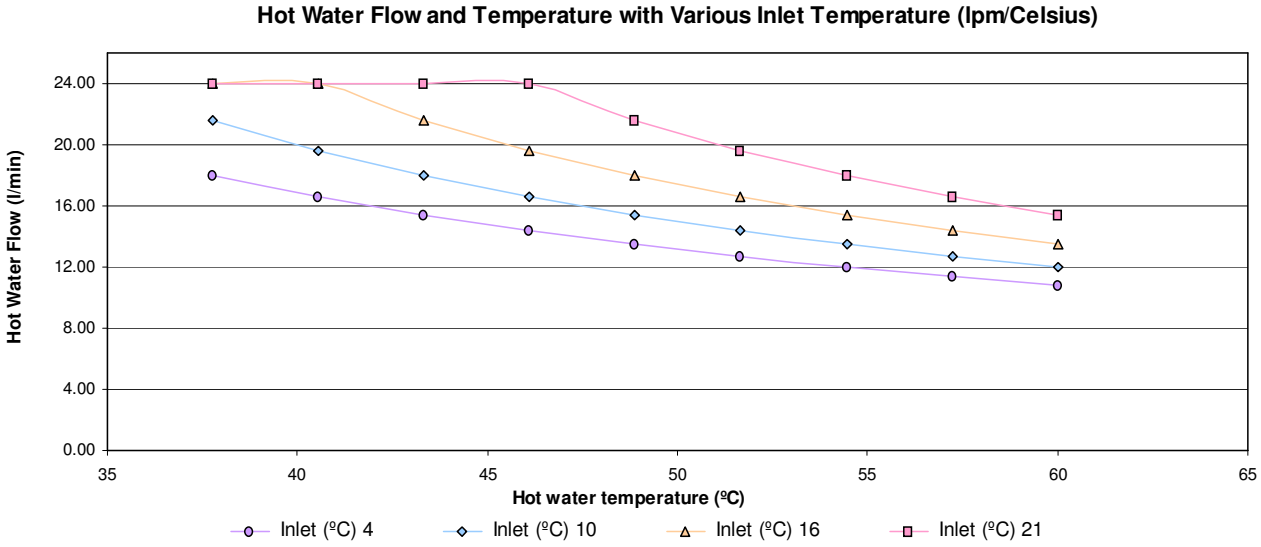
Fig. 29

If the outlet water temperature is set too high, the heater can produce temperatures that are too hot. A temperature balance shower valve can automatically mix in cold water to reduce such hot water temperature. In the event of any temperature instability with the use of a temperature balance shower valve, refer to shower valve manufacturer's instructions for internal adjustment setting. Adjustments should be made to the hottest setting in the shower valve. Additionally the temperature control of the heater can be lowered to produce a more comfortable hot water temperature.

Setting the water temperature

The desired temperature of the hot water can be adjusted on the front control panel of the heater.
The GWH-635-ES has an electronically controlled gas valve that modulates the burner input in response to both varying hot water flow rates and/or changes in any incoming and outgoing water temperatures.





Programming the heater to display temperature readings in Celsius is possible, contact BBTNA for instruction.

Fig. 30 Flow/temperature charts

3.3 Use of remote control accessory

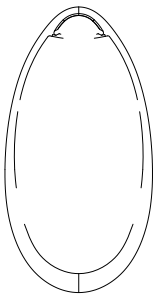


Fig. 31 Remote control

The wireless remote control accessory and the temperature selector buttons on the front of the water heater operate identically. Contact your distributor or BBTNA to order if the remote control accessory is preferred. Modification of the water heaters interior control unit (Fig. 29, component 12) is required when programming the remote control with this heater.

NOTE: up to 6 remote controls can be programmed for one single water heater, each with a range distance of 98 ft (30 m).

3.4 Operation

- When a hot water tap is opened, main burner ignites and LCD displays indication .

Fig. 32

- LCD blinks until selected temperature is reached.

3.5 Reset button

If the LCD shows the error symbol .
See the error code on LCD and consult "Troubleshooting" section.

Fig. 33

After following instructions indicated in "Troubleshooting" section

- press reset button in order to make the appliance ready-to-work.

Fig. 34 Reset button

If the problem persists, contact your installer.

3.6 Program button

Program button can be used/programmed in the appliance and in the remote control.

Programming "Program" function
Programming actions are similar for both controls (appliance control pad and wireless remote control).

Fig. 35 "Program" key

- Press buttons and to select temperature to be memorized.
- Hold "Program" button for 3 seconds to save temperature.

When LCD stops blinking. Temperature is saved on "Program".

Using "Program" function
In order to select memorized temperature

- Press "Program" key.

LCD shows pre-memorized temperature, which is now the hot water selected temperature.

3.7 Locked condition

This condition is only valid for appliances with more then 1 controller (appliances with remote control).

Fig. 36 Locked condition

Whenever LCD shows the temperature setting cannot be adjusted because the appliance is in use by a user which already selected a different temperature. Appliance will be automatically unlocked after closing hot water tap.

4 Maintenance and service

Warning: Always turn off the electrical power supply, turn off the manual gas valve and turn off the manual water control valves whenever servicing.

The unit should be checked once a year by a gas technician. If repairs are needed, the repairs should be done by a gas technician

To remove front cover

- ▶ Remove plastic decals on front panel (Page 5, Fig. 3).
- ▶ Loosen the two Philips head screws located behind decals.
- ▶ Lift front cover panel upward and remove.

Systems and parts that should be checked at least once a year

Reference diagrams on pages 29 and 30.

- Venting system
- Burners -see page 29 for observation window
- Manual operation of the pressure relief valve to insure correct operation
- Periodic cleaning of the water filter screen, see Fig. 25, chapter 2.13.
- Flushing the heat exchanger with a descaling solution if mineral build up is evident. Scale build up will shorten the life of the water heater, descale heat exchanger thoroughly and repeat annually depending on mineral content of ground water.

5 Troubleshooting

Introduction

The GWH-635-ES burner is activated by a water flow valve. Numerous water related problems can cause this water valve to malfunction such as: Insufficient water flow volume to activate the burners at its minimum flow requirement; Dirt in the water flow valve causing it to malfunction; Sediment build-up in faucet aerators, or shower heads; Uneven pressures between cold and hot (with single lever mix valves); and Plumbing crossovers. These water flow related problems can cause the heater to deliver less than its full output, or to fail to ignite or to shut down completely.
Problems stated below in upper case and in bold face should be investigated when there is a problem with the performance of the water heater but there is NO error code on the heater's LCD display or wireless remote control.
Any failures that result in a displayed error code are referenced on page 26. A Functional Scheme of the GWH-635-ES is detailed on page 28. If there is a problem with the installation, venting or operation of the unit, the heater will communicate the source by these error codes.

BURNERS DO NOT IGNITE WHEN HOT WATER IS TURNED ON

- **Cold incoming water connection made to wrong side of heater**
  Make sure cold water inlet connection is plumbed to the right side of heater when facing unit
- **Water flow rate at hot water tap is too low**
  A minimum of 0.8 gallon/minute (3 l/m) is required to activate the heater
- **Cold water inlet filter screen is dirty**
  Remove water inlet filter screen and clean. The screen is located at the inlet connection to the water heater, disconnecting the main cold supply line at the heater is required. Check and clean faucet aerator screens too.
- **Crossover in plumbing**
  The heater activates when there is sufficient water flow through its water valve, a minimum of 0.8 gallon/ minute (3 l/m) is required. If there is a crossover in the plumbing, the necessary hot water flow rate through the unit may not be reached, even though the flow at the hot water tap is sufficient. A plumbing crossover can be caused by a failed washer at a single lever faucet, incorrect plumbing or a faulty mixing valve in the piping. The crossover will create a back pressure on the water heater and prevent an adequate flow of water through it. To confirm there is no crossover in the plumbing, shut off the cold water supply feed to the water heater. Individually open each of the hot water taps. There should be no water flowing under a constant pressure. If there is a constant flow of water then the plumbing crossover must be corrected before the heater can operate properly.

WATER IS TOO HOT

- **Temperature selection too high**
  Lower temperature adjustment on heater or wireless remote control accessory, see chapter 3.2.

WATER IS NOT HOT ENOUGH

- **Temperature selection too low**
  Increase temperature adjustment on heater or wireless remote control accessory, see chapter 3.2
- **Btu input is too low due to inadequate gas line sizing**
  See specifications in chapter 2.10 - 2.12. The GWH-635-ES requires adequate gas pressure to reach desired temperatures, to compensate for inadequate gas supply or lack of gas pressure the GWH-635-ES will effectively reach the selected output temperature by reducing the hot water flow rate. Its motorized water valve makes this adjustment

- **Cold water is mixing with the hot water outlet (crossover)**
  Test by following 4th bullet under BURNERS DO NOT IGNITE WHEN HOT WATER IS TURNED ON.

LOW WATER FLOW/PRESSURE

- **Too many hot water applications are being used simultaneously or too much flow is being demanded**
  The GWH-635-ES will effectively support two 2.0-2.5 gpm shower heads simultaneously or multiple sink applications. Greater draws will result in increased pressure drop and reduced flow at taps. See flow/temperature chart on page 22.
- **Btu input is too low due to inadequate gas line sizing**
  See specifications in chapter 2.10 - 2.12. The GWH-635-ES requires adequate gas pressure to reach expected temperatures and flow rates, to compensate for inadequate gas supply or lack of gas pressure the GWH-635-ES will effectively reach the selected output temperature, but only by reducing the hot water flow rate. Its motorized water valve makes this adjustment. Proper gas pressure will need to be delivered before the motorized water valve will allow greater flow rates through it. Lowering the set temperature will also allow increased water flow rate through the motorized water valve. See flow/temperature chart on page 22.
- **Cold water inlet filter screen is dirty**
  Remove water inlet filter screen and clean. The screen is located at the inlet connection to the water heater, disconnecting the main cold supply line at the heater is required. Check and clean faucet aerator screens too.

HOT WATER TEMPERATURE FLUCTUATES / UNIT DEACTIVATED

- **Unbalanced pressure in water lines**
  Any restriction caused by the water heater in the hot water system can result in uneven pressures between the cold and the hot. In such cases when mixing cold water at the tap (manually or automatically through a mix-type shower valve) the lower hot water pressure may be overpowered by the higher cold water pressure in the building and cause the hot water flow rate to fall below the minimum rate required. A pressure balance valve will help to resolve this symptom.
- **Temperature balance valves**
  If the outlet water temperature is set too high, the heater can produce temperatures that are too hot. A temperature balance shower valve can automatically mix in cold water to reduce such hot water temperature. In the event of any temperature instability with the use of a temperature balance shower valve, refer to shower valve manufacturer's instructions for internal adjustment setting. Adjustments should be made to the hottest setting in the shower valve. Additionally the temperature control of the heater can be lowered to produce a more comfortable hot water temperature.
- **Inlet water pressure is erratic due to fluctuating supply water pressure**
  For installation on a private well system with the use of a pressure tank, the lowest pressure range setting recommended is 30-50 psi (2.07-3.45 bar). The use of a pressure reducing valve after the pressure tank is also an effective way to maintain a constant water pressure to the water heater. Watts brand 25AUB-¾" or N35B-¾" pressure relief valves or equivalent are suggested.

NOISY BURNER / HEATER DURING OPERATION

- CO_2 range is out of adjustment. The cover must be in place to confirm CO_2 readings. Operating with the cover removed may cause a noisy or unstable burner. See Chapter 9, CO_2 adjustments can only be done by a certified gas technician with a calibrated CO_2 analyzer.

Display	Cause	Solution
E9	Temperature limiter opened circuit (overheat). Trips at 220F (104C).	Check connections.* Check heat exchanger condition.*
EA	No ionization during safety time (safety time out). Note: appliance makes 3 ignition attempts before entering error mode “EA”.	Check gas pressure.* Check that gas is not diluted with air, as a result from recent gas pipeline rework.*. Check if vent terminal is blocked (especially when the appliance starts up for some seconds and then looses ionization signal).* Check ionization electrode.* Check for a proper ground.*
EC	The ionization signal momentarily disappeared more then 5 times in less then 30 seconds.	
FA	Leakage error (gas valves do not close gas circuit).	Check gas valve and control unit.*
F7	Ionization error (flame sensing at stand-by).	Check control unit.*
E0	Internal software/hardware failure.	Check control unit.*
A7	Hot water temperature sensor/receiver defect (from control unit).	Check water temperature sensor/receiver and connections.* Check room area temperature where heater is located, it must be above 36°F (2°C)
A9	Hot water temperature sensor/receiver mis-assembled (from control unit). Note: if display shows “A9” flashing, the appliance can be operated normally, but performance may be affected.	Close water tap and allow 30 seconds for purging time. Open water tap and wait for 2 minutes to see if A9 message is deleted from the display. Check that the water temperature sensor/receiver is properly assembled in the water pipe.* Check that the water temperature sensor/receiver is in proper condition.*
C1	FAN rotation too low at start-up (from control unit).	Check supply voltage.* Check fan and connections.* Check control unit.* Check if vent terminal is blocked or if vent terminal is according with chapter 2.9. * Check CO_2 levels (see chapter 9).*
C6	FAN rotation too low at operation (from control unit).	Check supply voltage.* Check fan and connections.* Check control unit.* Check if vent terminal is according with chapter 2.9.*
C7	No rotational speed sensor signal from FAN	Check fan and connections.* Check control unit.* Check CO_2 levels (see chapter 9).*
CA	Water flow signal over specified maximum value	Check water valve and flow sensor.*
E2	Inlet temperature sensor fault	Check water temperature sensor/receiver and connections.* Check room area temperature where heater is located, it must be above 36°F (2°C)
A2	Overheat protection fault	Check connections to the overheat protection.* Check sensor continuity.* Check heat exchanger sealings and walls.*

Table 7

** By installer or service technician only.*

6 Electrical diagram

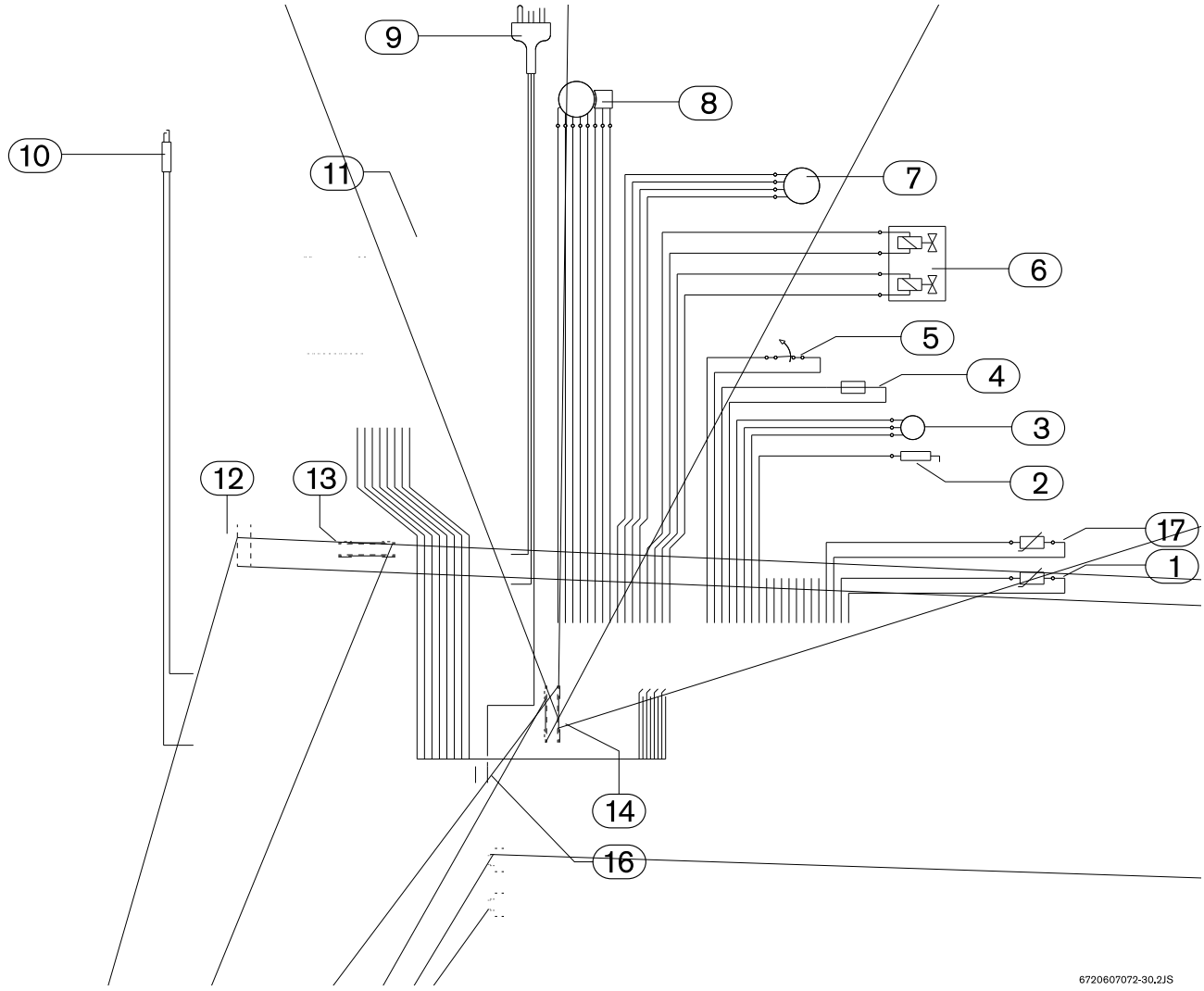


Fig. 37 Electrical scheme

1 Intlet water temperature sensor
2 Ionization sensor
3 Water flow sensor
4 Over heat protection
5 Temperature limiter
6 Gas valve
7 Fan
8 Water valve
9 AC Plug
10 Ignition electrode
11 Display PCB
12 ON/OFF switch
13 Fuse T 2,5A
14 Fuse T 3,15A
15 Terminal block
16 Ground post
17 Outlet water temperature sensor

7 GWH-635-ES Functional scheme

Fig. 38 Functional scheme

8 Interior components diagram and parts list

8.1 Interior components

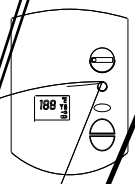


Fig. 39 Components

1	Cover
2	On/Off switch
3	Reset button
4	LCD display
5	Program button
6	Temperature switches
7	Flue gas collector
8	Mixer
9	Heat exchanger
10	Observation window
11	Inlet air duct
12	Control unit
13	Exhaust fan
14	Water valve
15	Gas valve

Fig. 40 Appliance overview

8.2 Components diagram

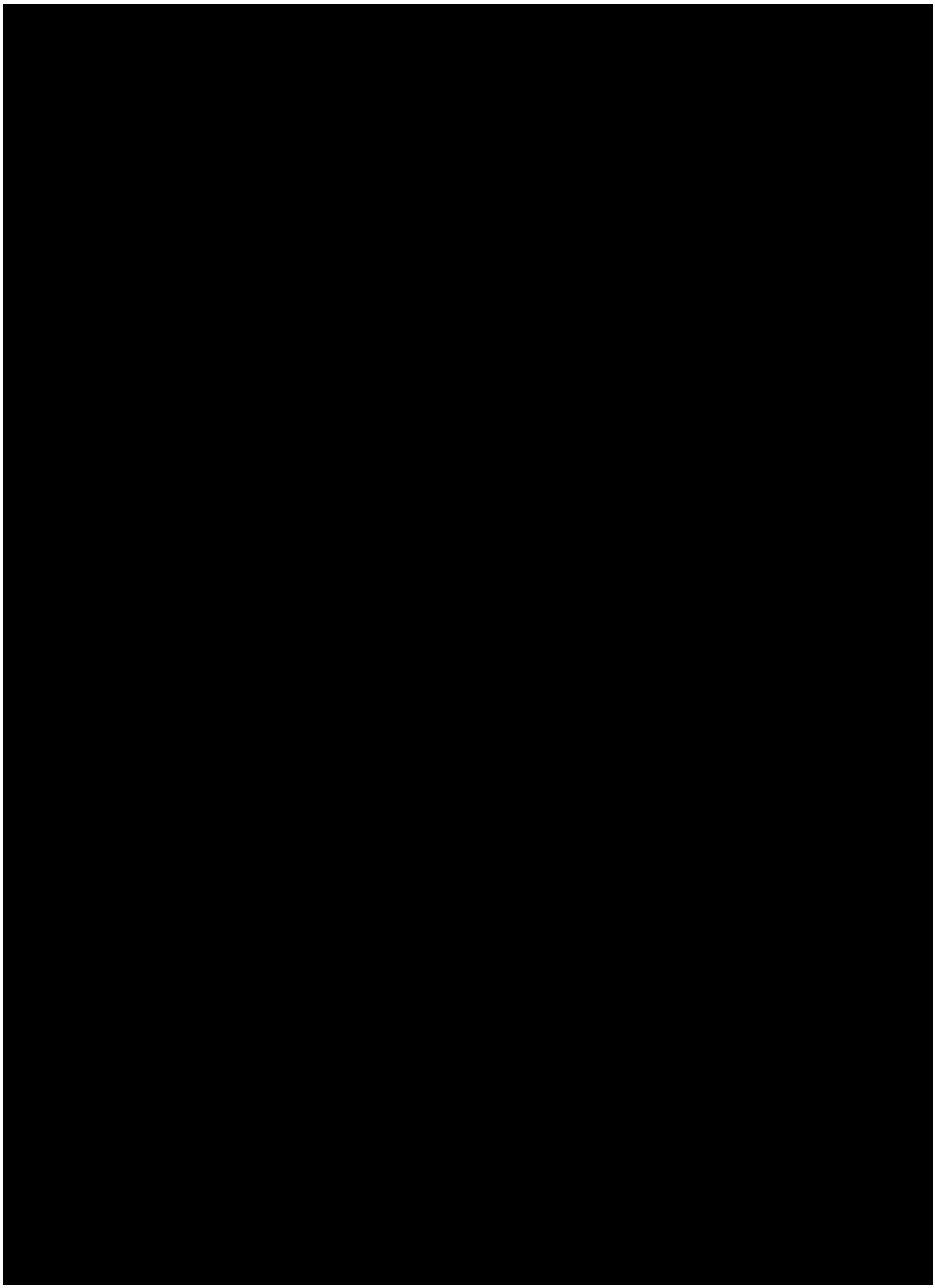


Fig. 41 Components Diagram

8.3 Parts list

Item	Description	Reference
1	Front cover	8 705 421 837
2	Shield	8 705 506 661
3	Heat exchanger	8 705 406 285
4	Heat exchanger top gasket	8 704 701 052
5	Clip	8 716 102 607
6	Heat exchanger bottom gasket	8 704 701 054
7	O-ring	8 700 205 147
8	Temperature sensor	8 700 400 015
9	Washer 1/2"	8 710 103 045
10	Wireform spring	8 714 606 002
11	Air inlet duct	8 705 700 097
12	Water filter	8 700 507 001
13	O-ring	8 700 205 134
14	Water valve with engine	8 708 505 016
15	Main burner	8 708 120 515
16	Fan / Burner gasket	8 704 701 050
17	Set of electrodes	8 708 107 020
18	Exhaust Fan	8 707 204 039
19	Gas / Air Mixer	8 705 700 115
20	Mixer / Fan gasket	8 704 701 059
21	Gas valve washer	8 704 701 062
22	Gas valve	8 707 021 019
23	Gas valve washer	8 700 103 014
24	Remote control	8 707 207 153
25	Control unit	8 707 207 133
26	Ignition cable	8 704 401 220
27	Cables / 24V	8 704 401 214
28	Cables	8 704 401 239
29	Power supply cord	8 704 401 221
30	Overheat cutoff fuse	8 700 400 019
31	Flue gas exhaust accessory	8 705 504 137
32	Combustion air inlet accessory	8 705 504 115
33	Flue gas collector	8 705 700 100
34	Flue gas collector collar	8 705 700 114
35	Cold water pipe	8 700 715 156
36	Hot water pipe	8 700 715 155
37	Air inlet screen	8 700 507 069
38	Crossover tube	8 700 715 247
39	Overheat sensor (ECO)	8 707 206 204
40	Clip - Heat exchanger	8 701 201 028
41	Clip - Over heat fuse	8 701 201 024
42	Gasket Exhaust	8 700 103 710
43	Gasket Set Combustion Chamber	8 704 701 046
44	O-ring air duct	8 700 205 149

Table 8

9 Special adjustment for measuring and adjusting CO_2 levels

The CO_2 can only be adjusted by a certified gas technician with a calibrated CO_2 analyzer.

Caution: One factor that may affect CO_2 levels is improper gas pressure. Please see Chapter 2.12 for the procedure to measure gas pressure and record your findings below:

Static Gas Pressure: ☐ " WC

P1 Operating Pressure: ☐ " WC

The P1 minimum operating pressure is 5" WC for Natural Gas and 11"WC for Propane. Do not proceed in adjusting CO_2 until pressure has been verified to be at or above these levels, but not to exceed 14" WC.

A. Once Pressure is good

- Turn ON/OFF switch to the OFF (O) position.
- Remove brass flat head screw on the exhaust collar as seen in Fig. 42.
- Insert CO_2 analyzer probe into the measuring port. The tip of the probe should be in the center of the flue pipe (approx 1.5" inserted).

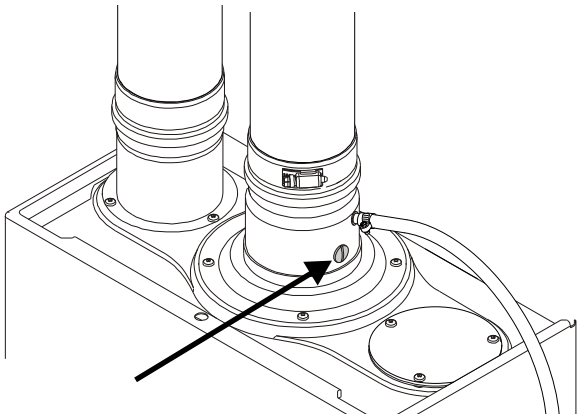


Fig. 42

- While holding the Program (M) button, move the ON/OFF switch to ON (I) position (see Fig. 43). As soon as '188' flashes on the display, release the Program button. The display should now read P2.

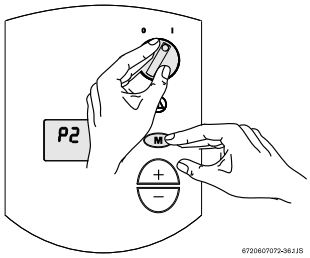


Fig. 43

B. Measuring CO_2 (Cover Installed):

- Open hot water taps to achieve a flow rate of at least 4 gallons per minute. (1 tub and 2 sinks should be sufficient).
- Record the CO_2 reading in P2 below. (Analyzer reading may take several minutes to stabilize).
- Press the '+' button until P1 appears. Unit will ramp up to high fire and the flow should increase.
- Record the CO_2 reading in P1 below.

P2 CO_2 Reading: ☐ % CO_2

P1 CO_2 Reading: ☐ % CO_2

Compare your readings to those found in table 9 under the "With Front Cover" column. If CO_2 readings are off make adjustments as outlined below.

Note: The "Without Front Cover" column give approximate values with the cover off to ease the adjustment process. Final readings should be taken with the cover on.

C. Adjusting CO_2:

Note: P1 adjustment will change the P2 reading. Confirm the P1 value BEFORE adjusting the P2 level.

1. P1 CO_2 level off:

- Loosen yellow painted Philips screw (1) and cover should rotate down (2) revealing a brass slotted screw. Fig. 44.
- Adjusting the slotted screw counter clockwise will raise P1 CO_2 levels and clockwise will lower P1 CO_2 levels. Adjustments to the slotted screw will also change P2 CO_2 levels.

2. P2 CO_2 level off:

- Remove yellow painted #40 Torx cover from the front of the gas valve. (Fig. 45) A plastic #40 Torx screw will be revealed.
- Adjusting the plastic #40 Torx screw counter clockwise will lower P2 CO_2 levels and clockwise will raise P2 CO_2 levels.

Note: These screw adjustment are very sensitive and may take several minutes to stabilize.

3. Verify both P1 and P2 are within the ranges specified in table 1 under the "With Front Cover" column. Repeat steps 1 and 2 as necesssary until CO_2 values are within the specified ranges.

D. Returning to Service:

1. Return slotted cover to original position.
2. Reinstall Torx cover.
3. Remove CO_2 analyzer probe and reinstall flathead screw in exhaust collar.
4. Turn ON/OFF switch to the OFF (O) position and then back to the ON (I) position.
5. Heater is ready for normal operation.

		Without Front Cover	With Front Cover
		Nat. Gas	**Nat. Gas**
max. input	P1	9.1 ± 0.1 %	9.7 ± 0.1 %
min. input	P2	9.4 ± 0.1 %	9.7 ± 0.1 %
		LP Gas	**LP Gas**
max. input	P1	10.1 ± 0.1 %	10.7 ± 0.1 %
min. input	P2	10.4 ± 0.1 %	10.7 ± 0.1 %
* Final reading must be confirmed with the front cover on, CO_2 levels increase when the cover is installed.			

Table 9

Final Readings

P2 CO_2 Reading: % CO_2

P1 CO_2 Reading: % CO_2

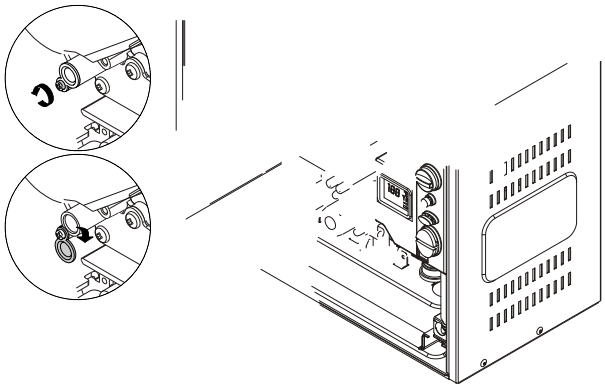


Fig. 44

Fig. 45

10 Protecting the environment

Packing

The packing box may be fully recycled as confirmed by the recycling symbol .

Components

Many parts in the heater can be fully recycled in the end of the product life. Contact your city authorities for information about the disposal of recyclable products.

Saving water resources:

- Make sure you close all the taps after any use. Avoid leaving the taps dripping. Repair any leaking tap.
- Whenever possible use taps with built-in water flow limiters. They will give you the same comfort level while saving water.
- Define the temperature you want, in the appliance or with the remote control. This way you have the precise water flow needed (mixing cold water to regulate temperature will increase the water flow with consequent waste of water).

For increased safety shut off the appliance from the main water supply if your are staying away from home for a considerable time.
At below freezing temperatures, disconnect the plumbing connections to the heater and allow the heater to drain.
To prevent any freeze damage, introduce short bursts of compressed air (20-40 psi) through these connections to remove the residual water in the horizontal pipes and water valve.

11 Fifteen Year Limited Warranty

General

BOSCH PRO water heaters are warranted by the Manufacturer (BOSCH) through **BBT** North America. **BBT** North America (BBTNA) will furnish a replacement heat exchanger and will furnish a replacement of any other part which fails in normal use and service within the applicable periods specified below, in accordance with the terms of this warranty. The BBTNA replacement will be warranted for the unexpired portion of the original warranty. This warranty will be valid only for water heaters in possession of the original purchaser as recorded on the warranty card.

The Heat Exchanger

If the heat exchanger fails within fifteen (15) years after the original installation and operation, BBTNA will furnish a replacement heat exchanger. However, if the water heater is installed in other than a single family dwelling, this heat exchanger warranty is limited to two (2) years from date of original installation and operation.

Exceptions

This warranty will not apply:

- **1.** to defects or malfunctions resulting from failure to properly install, operate or maintain the unit in accordance with the printed instructions provided;
- **2.** to damage or abuse, accident, neglect or freezing and other acts of nature;
- **3.** to damage resulting from operation with either the flame sensor rod or overheat sensor removed;
- **4.** to failure of the heat exchanger resulting from the operation of the water heater in a corrosive atmosphere or at water temperatures exceeding the maximum rating, or if the water heater is not supplied with potable water;
- **5.** to defects or damage cause by any attachment or modification, including any energy-saving device.

All Other Parts

If any other part fails within three (3) years after original installation and operation, BBTNA will furnish a replacement part free of charge.

Shipping costs

In addition to supplying the replacement part(s), BBTNA will provide ground service delivery for these parts. Expedited or upgraded shipping will be charged to the customer.

Service Labor Costs

This warranty does not cover any labor costs associated with service, removal or re-installation of part(s). All such costs must be borne by the Purchaser. Additionally, this warranty does not cover any labor costs associated with service, removal or re-installation of the original water heater or a replaced water heater. Certain service labor allowances are available to PHCC member contractors, dependent on prior authorization by BBTNA.

NOTE: the water heater must be free of damaging scale deposits and not subject to gas pressures greater than those shown on the rating plate, which must not be altered, defaced or removed**.**

How to Make a Claim

Any claim for warranty parts should be made to your local dealer, distributor or to BBTNA. If BBTNA, please contact the Technical Support Department:

BBT NORTH AMERICA
Bosch Group
340 Mad River Park
Waitsfield, VT 05673
Phone 866-330-2730
www.boschpro.com

In most cases, the dealer or distributor will be able to promptly honor your claim and subsequently notify BBTNA. However, all replacements are made subject to validation by BBTNA of in-warranty coverage. The damaged or defective item must be made available in exchange for the replacement.

Miscellaneous

No one is authorized to make any other warranties on behalf of BBTNA. It is expressly understood that the replacement warranty of BBTNA shall be in lieu of any and all other warranties, express or implied, including warranties of merchantability or fitness for a particular use or purpose, and further that BBTNA shall not be liable for any loss or damage directly or indirectly arising from the use of the hot water heater, or for any consequential damages arising from such use (including damages from water leakage). BBTNA sole liability with respect to any defect shall be for the replacement of the defective part(s). Some states do not allow such limitations and exclusions, so the above may not apply to you.
This warranty gives specific legal rights. You may also have other rights which vary from state to state.

Installer Checklist, to be performed by installer upon installation

Serial Number ___ ___ ___ ___ ___ ___ ___ ___
(8 digit serial number is located on rating plate on right side panel)

Gas Pressure Reading* Static_____ Operating_____

Building Water Pressure _____ Range if on Well system _____

Installing Company _____

Installer name _____

Address _____

Phone _____

* See Chapter 2.12 and gas pressure table (to be filled out by installer)

Installation manual should be left with the owner after the installation is tested and completed

Replacement Parts available from:

BBT NORTH AMERICA
Bosch Group

Bosch Water Heating
340 Mad River Park
Waitsfield, VT 05673
Phone 866-330-2730
Fax (802) 426-6924
www.boschpro.com
techsupport@boschpro.com

VULCANO Termodomésticos S.A.
Estrada de Cacia
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